Technical Specification for He temperature Cooling System

1 Introduction

Code 552 will test cryogenic components for use with flight projects supported by Branch personnel. In order to complete future projected tasks, Code 552 will procure a cryo-refrigerator for use in a test dewar. The technical specifications are outlined below.

2 General description

The cooling system shall be a two-stage pulse-tube cryocooler. Projected future tests are vibration sensitive. Therefore, the cryocooler shall be provided with a passive vibration damping system and separate motor assembly. The closed-loop cooling system, shall be comprised of a closed cycle cryocooler cold head, compressor, one pair of gas lines, and a separate valve motor assembly and gas line. The gas line between the cold head and valve motor shall incorporate an electrical isolator. All gas line connections shall use Aeroquip fittings.

2.1 Closed-loop Cooling System Thermal Requirements

The cryocooler shall be a two-stage Pulse tube cooler providing a heat lift no less than 30 Watts (W) at 45 K on the first stage, while simultaneously having no less than 0.9 W at 4.2 K on the second stage. The cryocooler shall cool to a temperature below 3.0 K on the second stage with no heat load.

2.2 Cool Down Time Requirement

The cryocooler second stage shall cool down from 295 K to an operating temperature of 4.0 K within 60 minute period.

2.3 Cryocooler Interface

The cryocooler interface shall be flexible in order to minimize the amount of vibrational excitations transferred to the dewar. Therefore, the stiffness of the cryocooler interface at the room temperature flange shall not exceed 1000 lbs/in or 175,000 Newtons per meter (N/m).

2.4 Compressor Requirements

A compressor shall be provided in order to pump the helium gas through the closed cycle cold head. This compressor shall operate on 3-phase 60 Hertz 230 Volt (V) AC power, and shall consume no more than 8.0 kilo-W. It shall be water cooled with a required flow rate no greater than 9 liters per minute at 80°F (27°C). One set of gas lines for the compressor shall be supplied. They shall be standard length. One remote motor connecting line shall be supplied and shall be approximately 2 ft (0.6 m). A second remote motor connecting line shall be supplied and shall be approximately 5 ft (1.5 m). The compressor gas lines and the remote motor gas line shall have Aeroquip fittings on both ends.

2.5 Electrical Isolation Requirement

The remote motor connecting line shall have electrical isolation. The remote motor gas line shall be electrically isolated at the junction of the gas lines and the motor with an insulating spacer.

3 Quality Assurance Requirement

All manufacturing and testing shall be conducted in accordance with ISO 9000 procedure. Complete documentation according to ISO 9000 procedure is not required.